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Best Available Copy

(54) Transmission and storage of document images

(57) To reduce the cost of transmitting by facsimile documents to remote stations the invention splits the document into fixed data 2 which is common to all documents of a particular class and variable data 3 which is specific to the particular document. The area of application described is the processing of proof of delivery notes for parcel delivery services, the fixed data 2 being held at a remote terminal and the variable data, 3, being transmitted to it as required for combination to produce a copy of the original document.

RECORD OF DELIVERY		
DATE: 11/1/92.	NO OF ITEMS: 7.	WEIGHT: 5 kg.
DELIVER TO: ABC LIMITED 100 SMITH ST. MANCHESTER		REF: A1.
COMMENTS: 6 OUT OF 7 ONLY.		
SIG: A. Brown	DATE DELIV.	
<input checked="" type="checkbox"/> A/C NO: 123456.	1992.	ABCDE

FIG. 1.

1/3

RECORD OF DELIVERY		
DATE: 11/1/92.	NO OF ITEMS: 7.	WEIGHT: 5 kg.
DELIVER TO: ABC LIMITED 100 SMITH ST. MANCHESTER		REF: A1.
COMMENTS: 6 OUT OF 7 ONLY.		
SIG: <i>A. Brown</i>	DATE DELIV.	
<input checked="" type="checkbox"/> A/C NO: 123456. 1992. ABCDE		

FIG. 1.

RECORD OF DELIVERY		
DATE:	NO OF ITEMS:	WEIGHT:
DELIVER TO:		REF:
COMMENTS:		
SIG:	DATE DELIV.	
<input checked="" type="checkbox"/> A/C NO:		

FIG. 2.

11/1/92	7	5 kg
ABC LIMITED 100 SMITH ST MANCHESTER		A1
		6 OUT OF 7 ONLY
SIG: <i>A. Brown</i>		
<input checked="" type="checkbox"/>	123456	1992 ABCDE

FIG. 3.

2/3

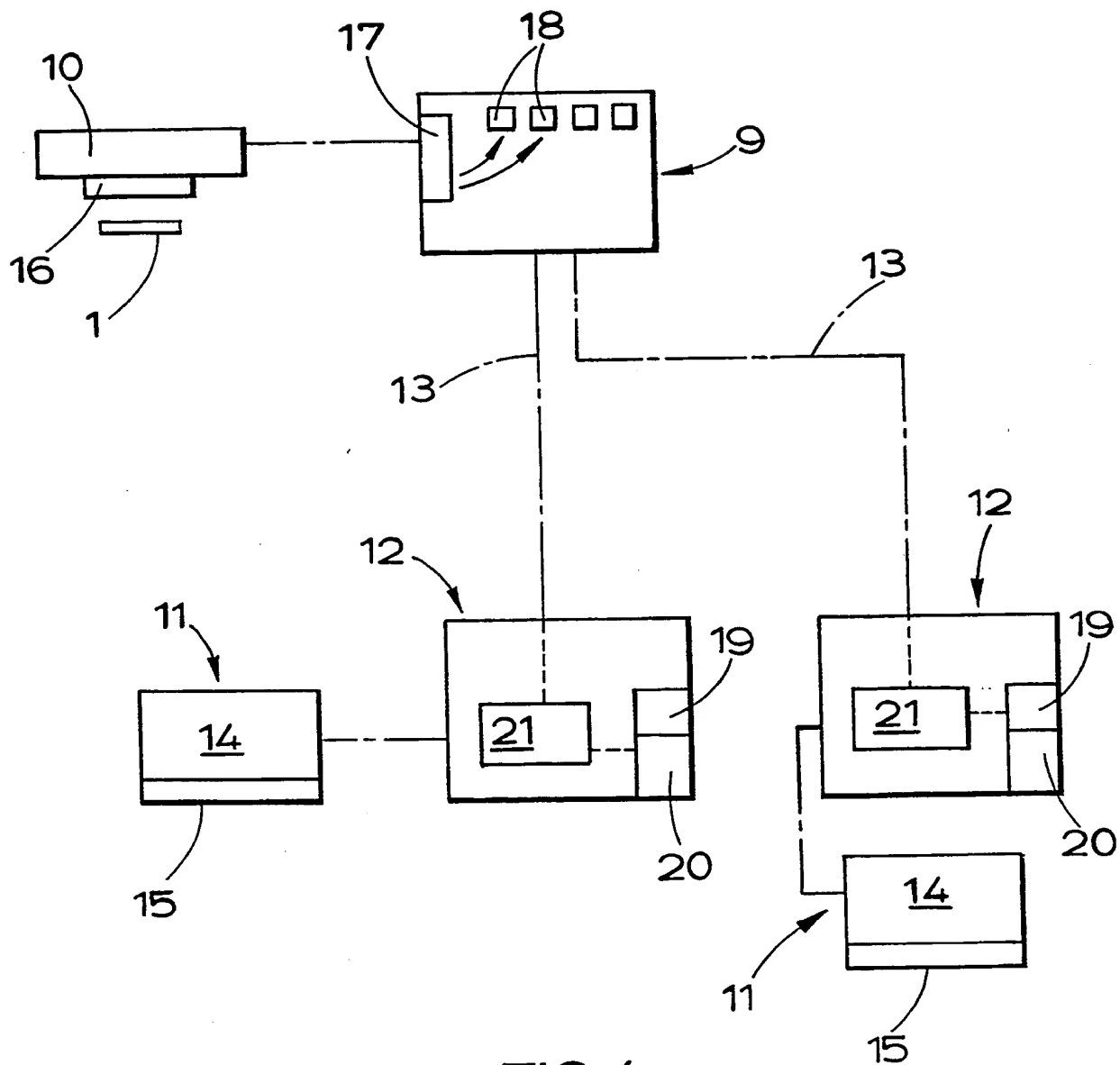


FIG. 4.

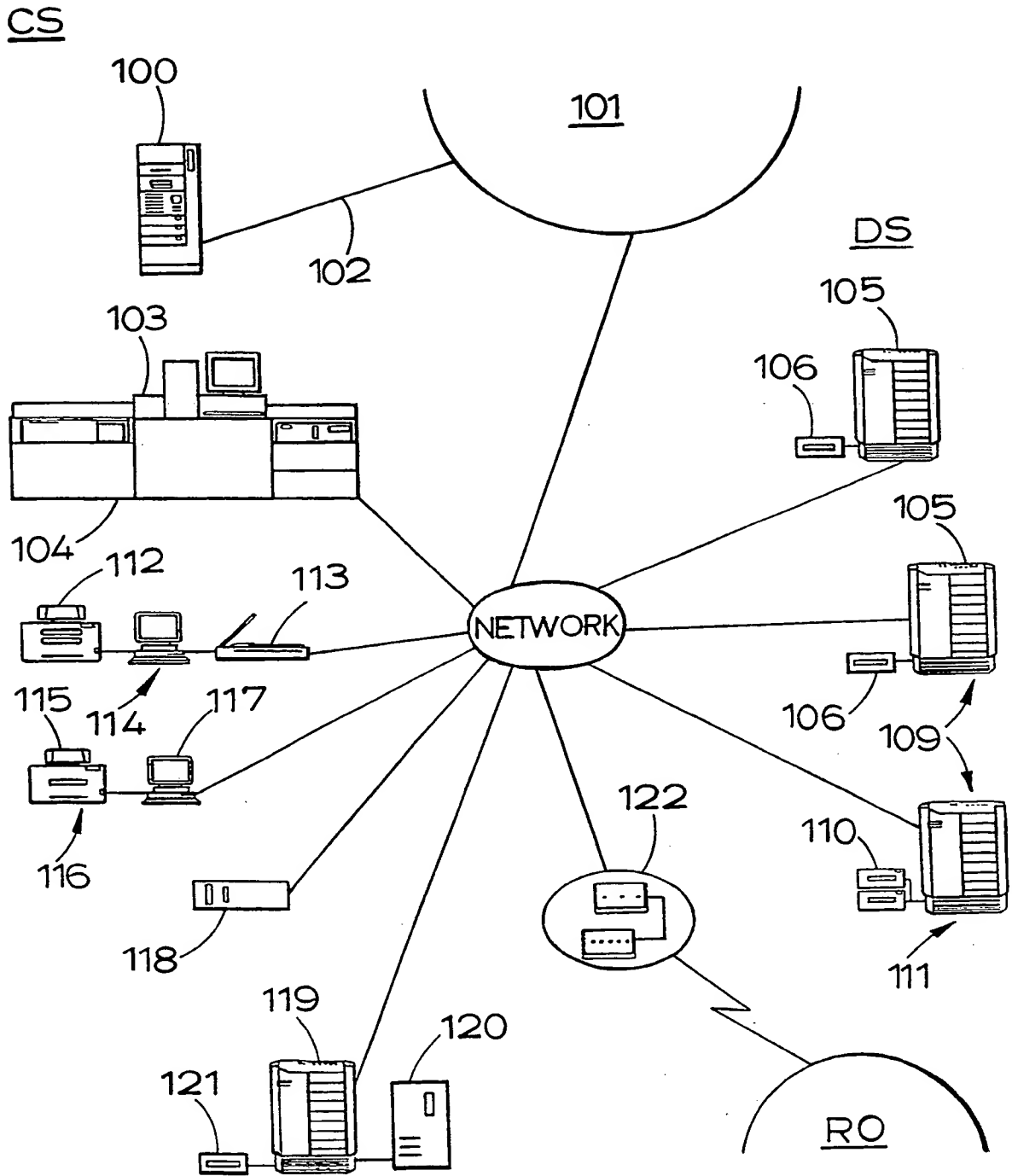


FIG. 5.

IMPROVEMENTS IN AND RELATING TO THE
TRANSMISSION AND STORAGE OF DOCUMENT IMAGES

This invention relates to improvements in data transmission and storage, especially, but not exclusively, to the transmission, storage, and retrieval of document images.

Storing and transmitting data is a growing problem for many businesses. As an example the storage of Record of Delivery Slips for a parcel or goods delivery business will be discussed. It is important in such a business to retain a copy of the original Record of Delivery Slip signed by the customer, and to have it available for recovery from whatever record system is used for presentation later. For example, a signed Record of Delivery Slip can be conclusive proof that goods were in fact delivered, and can also be useful in showing just what complaints the customer had at the time of delivery.

At present Record of Delivery Slips are transported from regional delivery depots to a central records office where they are microfilmed onto cassettes. A computer record tracking system is used to bring the image of any selected Record of Delivery Slip into position on a viewfinder for visual inspection and/or enlarged photocopying. The hard copy of the requested Record of Delivery Slip is then sent off to the delivery depot who requested it and can be used to settle a query.

The process discussed above is costly because the manual loading/unloading of the microfilm cassettes is labour intensive, and because the central processing of the microfilm records creates a bottleneck in the

enquiry system. The delay in getting the photocopy of the Record of Delivery Slip to the regional delivery depot is also not desirable.

It is known to digitise images and store them electronically in a computer memory, or optically on C.D.'s. Fully automated computerised cassette retrieval systems can also reduce the labour content of the retrieval process. However, the centralised processes of queries still cause a bottleneck, and the printouts of the Record of Delivery Slips still have to reach the regional delivery depot.

It would be possible to have record access terminals in the delivery depot, but this requires the electronic transmission of the digitised images of the Record of Delivery Slips to the delivery depots. It is expensive to transmit data down telephone lines and the cost of operating remote terminals could be high. At present there is a lot of work being done on compressing data into a short duration burst for transmission down a telephone line. The compressed burst can then be expanded to its proper length. This reduces the transmission costs.

An aim of the present invention is to improve data transmission and/or storage.

According to a first aspect the invention consists in a method of transmitting a data record from a first location to a second location via transmission means, the method being applicable to data records of the kind which comprise fixed data which is always present in said data record and variable data which varies from individual data record to individual data record of that kind: the method comprising the steps of providing

at the second location fixed data reproducing means which stores the fixed data; and transmitting to the second location, via the transmission means the variable data, without transmitting any of the fixed data, or at least without transmitting a substantial part of the fixed data.

Less data is actually transmitted than if we were to transmit the whole of the data record. This makes the method cheaper, especially when the transmission means is a telephone line.

Preferably the method also comprises scanning said data record and extracting from it only the variable data (or substantially only the variable data). The extracted variable data may be stored at the first location, with the fixed data being discarded at the first location. Alternatively the variable data may also be stored at the second location, once it has been transmitted to the second location. The variable data may be stored electronically (for example in the memory of a microchip or magnetic disc), optically (for example in a C.D.), or in any other appropriate way.

Preferably the second location is provided with combination means which adds the fixed and transmitted variable data to reproduce the original data record. The addition of the fixed and variable data may be done electronically (for example by a computer). Alternatively, the fixed data and the variable data could be reproduced onto a visible record separately of each other, but both being simultaneously visible. The original data record is preferably reproduced in hard copy at the second location.

The fixed data could be pre-printed on a form and the variable data added to it.

The combination means preferably includes alignment means which performs the step of aligning the imaging of the variable data with the imaging of the fixed data so that the two sets of data are not misaligned relative to each other when they are reproduced in visible form.

According to a second aspect the invention consists in a method of reducing the memory capacity of a data storage device that is required to hold the contents of a plurality of data records, the method comprising scanning data records to be held in the memory of the device, splitting the data records into fixed data common to all data records of a particular kind or class and variable data which differs from data record to data record within said kind, and storing at respective memory store addresses the respective variable data of different data records, without storing the fixed data at said memory store addresses which hold the variable data.

Preferably the method comprises storing the fixed data of a particular kind of data record once in a fixed data address, or at least storing the fixed data for fewer times than the variable data is stored.

Thus we can use far less memory capacity than if the whole of the data record were stored for each data record.

According to a third aspect of the invention we provide data splitting apparatus comprising scanning means for scanning a data record, data storage means

for storing variable data transmitted to it, and filtering means which filters out some of the data presented to the scanning means and transmits some of the data presented to the scanning means to the data storage means, the arrangement being such that all, or a substantial part of, fixed data common to all data records of a particular kind is not transmitted to the data storage means during the operation of recording a data record.

The filtering means could be arranged so as not to see the fixed data, or it could see the fixed data but remove it from the data which it transmits to the data storage means. The filtering means may have removal means adapted to remove from the data of a data record the fixed data. The removal means may include a comparator.

According to a fourth aspect of the invention we provide a data record display device comprising a reproducible record of fixed data which all data records of a particular kind have, receiving means adapted to receive variable data of said kind from a remote source, and display means adapted to display the fixed and variable data in a combined, full record, form.

The device may have combination means adapted to combine the fixed and variable data of a data record prior to display of the record at the display means. Preferably the device has printing means adapted to print or otherwise reproduce a hard copy of the original full data record.

According to a fifth aspect the invention comprises a system comprising data splitting apparatus

in accordance with the third aspect of the invention, at least one data record display device in accordance with the fourth aspect of the invention remote from the data splitting apparatus, and transmission means connecting the data splitting apparatus and the data record display device, the arrangement being such that the system operates in accordance with the first and/or second aspects of the invention.

Preferably the system comprises a plurality of data record display devices networked to a common memory storage device for the variable data.

The system may enable visible records, preferably permanent hard copy records, to be obtained at the data record display devices. Printer means may be provided to achieve this. There may also be a plurality of data splitting apparatus allowing variable data to be input from a plurality of locations.

The data stored or transmitted in any of the aspects of the invention is preferably a visual image, such as a document image, the image being treated as a fixed image component and a variable image component.

Of course it will be appreciated that there may be two or more different kinds, or classes, of data records. Appropriate identification tags would then be provided on the data records to distinguish those of one kind from those of another, and there would be identification means performing the step of identifying to which kind of data record any particular data record belongs. The variable data would then include a label identifying the particular kind of data record so that the correct one of the (various) fixed data records

could be merged with the variable data after transmission of the variable data.

An embodiment of the invention will now be described by way of example only, with reference to the accompanying drawings of which:-

Figure 1 shows a full Record of Delivery note;

Figure 2 shows fixed data present in every Record of Delivery note of the kind of Figure 1;

Figure 3 shows the variable data of the Record of Delivery note of Figure 1;

Figure 4 shows schematically a system for the transmission of data records to a remote station; and

Figure 5 shows another operational network system similar to that of Figure 4.

The main principle behind the invention is illustrated in Figures 1 to 3. Most, or at least many, documents which need to be recorded comprise two sorts of data: fixed data which is present on all similar documents, and variable data which varies from document to document within the particular class, or kind. In the example shown, the document to be recorded is a Record of Delivery note or form 1 which has fixed data 2, such as the lines on the form, the instructions on how to fill in the form, and so on, and variable data 3 which is specific to the delivery of a particular parcel, such as the address 4 of the customer, the customer's signature 5, and any extra additions 6 made to the blank form. The form also has

an alignment mark 8 which is considered to be present in the fixed and the variable data for reasons explained below.

Figure 4 schematically shows a system for the transmission of data records corresponding to Record of Delivery sheets to remote stations at regional delivery depots. A central memory unit 9 is provided at a first location and is linked to a scanner 10. The scanner 10 may be in the vicinity of the memory unit 9 or it may be remote from it and connected to it by transmission lines, radio communication, or any other suitable way. The scanner 10 is provided with a filter 16. Remote data displaying devices 11 are provided at second and third locations remote from the location of the memory unit 9 and are connected to respective record data generating, or combining, units 12 which are connected to the memory unit 9 by telephone lines 13. The data displaying devices 11 comprise a VDU 14 and a printer 15.

The memory unit 9 has a classifier 17 and a great number of memory addresses 18 to which data to be recorded is sent.

Each combining unit 12 comprises memory stores 19 and 20 for fixed data corresponding to two different kinds of form 1, and a combiner 21.

The fixed data on the Record of Delivery forms is printed on them using a special ink which is invisible to the scanner 10 because the filter 16 removes it from the light reaching the scanner. The filter 16 is a narrow band width stop filter which filters only a very specific colour. Thus only information recorded on the Record of Delivery form 1 in ink other than that used

to present the fixed data shows up to the scanner 10. This is the variable data, which can typically require half or one-third of the memory capacity of memory unit 9 to store than the information content of the fixed plus variable data.

The classifier 17 looks at the variable data of the form 1 and identifies to which class or kind of data record it belongs and labels the variable data sent to one of the memory address 18 with an appropriate "class" label. It will be noted that the alignment mark is also part of the variable data. The alignment mark 8 is first used when printing the customers address 4 and account number on the original blank form. This is done automatically using a printer and the alignment mark ensures that the details are centred correctly on the form. The alignment mark may also be used to identify the class or kind of the form.

When a user at a remote displaying device 11 wants to have a copy of a particular Record of Delivery form 1 he requests it using an on-line terminal (not shown) and the memory unit 9 transmits the information in the appropriate address 18 (the variable data) down the lines 13 to the unit 12. The variable data is fed to the combiner 21 which identifies which class of variable data has been sent from its label and adds to the variable data the fixed data (from store 19 or 20) appropriate to that class. The combiner 21 also ensures that the alignment mark of the variable data corresponds with that of the fixed data so as to ensure that the Record of Delivery form is re-combined properly and is not mis-aligned. The combined, whole, data record is then presented to the VDU 14 and/or printer 15 at the command of the user.

It will be appreciated that not all of the variable data shown on the Record of Delivery form need in fact be transmitted since some of it may be considered to be fixed data after all. For example, the customers address will have a one-to-one correspondence with the customers account number so that once the, shorter, account number has been transmitted the combining unit 12, could look up the address for itself from its own, local, memory.

It will be appreciated that if each delivery depot had its own scanner 10 the variable information could be input into the central memory unit 9 from networked remote locations, as well as being output to them.

Although one way of separating the fixed data from the variable data has been described, and termed filtering, it will be appreciated that "filtering" is also intended to cover other ways of splitting the data into a portion to be recorded, and transmitted, and a portion to be discarded. The filtering could be performed electronically if the scanner had a record of what a blank form (fixed data) looked like. It could, for example, simply subtract the pixels representing a blank form from those actually seen to leave the variable data. Indeed, we now believe that electronic filtering is preferable to printing forms with a special ink.

Another network system is shown in Figure 5. This has a central system (CS), a document storage system (DS), several regional offices (RO), and a communications network linking them. The central system incorporates the document storage system.

A control computer, such as an AS 400, referenced as 100 in Figure 5, is connected directly by twin axial connections 102 to each of a plurality of workstations 101. The workstations 101 enable the user to view Proof of Delivery notes (after recombination) and also of customer service applications.

The central system CS has a data capture unit 103 such as a Trace 4000. This can capture 25000 Proof of Delivery notes each day and supplies them directly to a database queue server. There is also a unit consisting of control unit 114 and scanner 113 to capture any documents unable to go through the capture unit 103, thus ensuring that all documents are captured.

Figure 5 also shows a print and fax control station 117 of the central system with a 17 page/minute laser printer 115 attached. This receives requests to print or fax Proof of Delivery to customers from all remote sites. Taking only the required data to be inserted into standard documents the images are combined with the standard letter and then sent to print or to fax on its combined form.

Unit 118 is a fax machine under central control receiving fax requests from 117 and transmitting as required.

The central system has a database queue server 119 controlling access to all records on the system either on magnetic disc 105 or on optical disc 120. The juke box can hold 50 optical discs covering 12 months records. The document storage side of the central system is referenced DS. The magnetic storage can hold about 3.5 million records or about 6 months worth. Magnetic type backup (106 + 121) is provided to copy

all records in case of failure of equipment requiring reconstitution of the databases. The data held on magnetic disc is also copied to optical disc and held in the juke box 120, and on a daily base the magnetic disc records are cleared down under the control of the remotely attached application computers at each remote site. The retrieval mechanism first looks for a magnetic image and if it cannot find it then looks for an image of an optical disc 120. As all active data is held on the remote control computer (AS/400) they are used to control the image data held on the magnetic store 105. Although there is capacity for 6 months worth of records these span 12 months and represent the most used 6 months worth of records and exactly match the application system data stored remotely.

The reference number 122 represents bridge connections to a regional office. There may be 20 connections to 20 regional offices.

The overall system has a 10 second response time when connected to a regional office. The Proof of Delivery notes can be viewed on the view screen in the various units (shown in the diagrams) in the recombined format - that is to say looking like the original Proof of Delivery notes. Furthermore, the printers, of course, print the recombined Proof of Delivery note which looks the same as the original.

A further advantage of the network system described is that the central office can send out standard letters to anywhere in the world using the network. There may also be some saving in transmission costs if standard paragraphs are held in regional machinery and only the instructions on how to combine them are transmitted, or perhaps new non-standard,

paragraphs are actually transmitted down the fax or telephone lines, standard paragraphs being considered as fixed data.

The data capture unit 103 may be provided at regional offices and enables them to capture the data from regional Proof of Delivery notes at the regional offices, with the data being transferred electronically to the central storage system. This saves there being a backlog of data capture work to do at the central office. This also avoids postal delays.

With an electronic memory system it is far easier to search for a Proof of Delivery note by its Proof of Delivery number.

By way of background, it is estimated that the database size required in this particular example is likely to be 24 Gigabytes for 7.0 million records. The database queue server will have 4 Gb of disc.

Index information for each optical cartridge will be held on the database queue server 119 and on the individual optical cartridge itself. This allows easy retrieval should the cartridge ever be required off-line.

The estimated time for archived optical indexing and querying proof of delivery notes on line each day should be about 2 hours. The archiving may be performed later, outside working hours, if the system is too busy in the day.

It is anticipated that the document can be retrieved in about 2.5 seconds for a user at the central site 101 and about 10 seconds for a user at a regional office.

CLAIMS

1. A method of transmitting a data record from a first location to a second location via transmission means, the method being applicable to data records of the kind which comprise fixed data which is always present in said data record and variable data which varies from individual data record to individual data record of that kind: the method comprising the steps of providing at the second location fixed data reproducing means which stores the fixed data; and transmitting to the second location, via the transmission means, the variable data, without transmitting any of the fixed data, or at least without transmitting a substantial part of the fixed data, and combining the fixed data of the fixed data reproducing means with the transmitted variable data so as to reproduce the data record.
2. A method according to claim 1 which also comprises scanning said data record and extracting from it only the variable data (or substantially only the variable data).
3. A method according to claim 1 or claim 2 in which the second location is provided with recombination means which has the fixed data and recombines the fixed and transmitted variable data to reproduce the original data record.
4. A method according to claim 3 in which the original data record is reproduced at the second location in hard copy form by printer means.
5. A method according to claim 3 or claim 4 in which the layout of the fixed and variable data are aligned at the combination means.

6. A document record display device comprising a reproducible record of fixed data which all document data records of a particular kind have, receiving means adapted to receive variable data of said particular kind of document data record from a remote source, and display means adapted to display the fixed and variable data in a combined, full record, form.

7. A device according to claim 6 in which combination means is provided adapted to combine the fixed and variable data of a data record prior to display of the record at the display means.

8. A device according to claim 6 or claim 7 in which printing means is provided, the printing means being adapted to reproduce in hard copy the original data record formed from the recombination of the fixed and variable data.

9. Data splitting apparatus comprising scanning means for scanning a data record, data storage means for storing variable data transmitted to it, and filtering means which filters out some of the data presented to the scanning means and transmits some of the data presented to the scanning means to the data storage means, the arrangement being such that all, or a substantial part of, fixed data common to all data records of a particular kind is not transmitted to the data storage means during the operation of recording a data record.

10. A method of producing a copy of an original document comprising the steps of scanning the document and dividing its contents into fixed data present in documents of a known class and variable data which may differ between documents of said class, sending a

signal containing the variable data, but not the fixed data, to the remote station, providing the remote station with a record of said fixed data, recombining the fixed and variable data at said remote station, and producing a hard copy of the original paper document at said remote station.

11. A system comprising data splitting apparatus in accordance with claim 9, at least one document record display device in accordance with claim 6 remote from the data splitting apparatus, and transmission means connecting the data splitting apparatus and the data record display device, the arrangement being such that the system operates in accordance with the method of claim 10.

12. A method of reducing the memory capacity of a data storage device that is required to hold the contents of a plurality of data records, the method comprising scanning data records to be held in the memory of the device, splitting the data records into fixed data common to all data records of a particular kind or class and variable data which differs from data record to data record within said kind, and storing at respective memory store addresses the respective variable data of different data records, without storing the fixed data at said memory store addresses which hold the variable data.

13. A method of reducing the cost of retrieving a document from a document store and providing a hard copy of it at a remote location, the method comprising the steps of storing the document in accordance with claim 12 and transmitting it to the remote location and reproducing it in accordance with claim 10.

14. A method of transmitting a data record from a first location to a second location substantially as described herein.

15. A method of producing a copy of an original document substantially as described herein.

16. A method of reducing the cost of retrieving a document from a document store and providing a copy of it at a remote location substantially as described herein.

17. A network document retrieval and transmission system substantially as described herein.

GB 9300392.9

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

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